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Social Presence to Fill the Void in Distance Relationships

How can communication technologies turn absence into fondness of the heart, rather than a painful drift out of mind?

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Abstract In general terms, social presence is a feeling of togetherness regardless of spatial or temporal separation. It is a socioemotional attitude that reflexively centers on other people via perceptions of their affective attitudes towards oneself. Communication technologies contribute to the maintenance of close personal relationships by facilitating welcome and timely socioemotional presence in the mind of an absent other. Presence of this kind may be 'in the moment' of communication, and persist over time as it is 'topped up' by repeated interactions. In this paper, we consider how the type of a personal relationship might condition the value of a range of communication technologies, and in turn how such technologies lend themselves to the generation of social presence. Through a 21-day study with 64 participants, we report ratings of Closeness and Social Presence and contrast the influence of relationship type and degree of separation on experiences with communication media. We relate our findings to new ways of thinking about the connection between people who care about one another, especially the relationship between Social Presence and Closeness.

Keywords Social Presence, Closeness, Relational Communication

CR Subject Classification H.5.2, Information Interfaces and Presentation · H.4.3, Communications Applications Miscellaneous

1 Introduction

From time to time, large numbers of people have to suffer periods of separation from the people they care about most. Whether it be couples in a long-term relationship, siblings, parents, children or best friends, the sense of social isolation and emotional disconnection can be debilitating. In these circumstances, interactive communication technologies cease to be tools of convenience but become a special kind of life line; they are mechanisms for sustaining personally important relationships. By interacting with one another through the likes of IM, email and VOIP, people who care about one another create new ways to understand one another, reconstituting the experience of living together to the extent that their circumstances allow. The mediated experiences of those in distance relationships become woven into their mutual understandings, as they negotiate the daily trials and tribulations of their separated lives.

The feeling of presence lies at the centre of all mediated experiences. In his review, Lee argues that presence is 'a psychological construct dealing with the perceptual process of technology-generated stimuli' regardless of whether the feeling is of physical, social or self presence, (Lee 2004)(p. 30). A key element of the construct is an attitude towards some object (self, environment, other) that is characterised by an abstract sense of mental transportation. The circumstances of a person's real setting are altered so that the person's experience is of incorporating remote or virtual objects as elements of their immediate psychological reality. Social presence could be thought of as a subconcept of presence, just by considering the coexistence and responsiveness of virtual objects that happen to be other people. However, social presence is not just a matter of noting that other social agents coexist with oneself in an environment. As Biocca, Harms & Burgoon observe, the requirements for incorporating other people into a workable mental model are rather different from other virtual objects or mechanisms because they must help one to infer the intentional states of others (Biocca and Harms 2003). Technologically mediated social presence cannot sensibly be disconnected from considera-

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tions of social relations in general. In particular, the intersubjectivity of social experience means that thoughts about others implicitly involve thoughts about the self. It is distinct from copresence precisely because of this reflexivity. Indeed, the self-other distinction becomes problematic in close personal relationships.

In thinking about those for whom we care, we cannot help but think about the thoughts they in turn have about ourselves, and how that relationship works in the wider social settings we encounter. In addition to the necessary 'self', 'other' and 'environment', people in relationships typically also create an 'us'. It is possible for intersubjective relations to be developed and maintained in almost any medium: as Schultze points out, the origins of most virtual worlds can be traced back to interactions in persistent text-based worlds (Schultze 2010). The spatial nature of such environments was largely imagined, albeit formally specified by the programming actions permitted of players and text statements about 'room' occupancy, and sense of temporal connectedness is primarily in the mind, supported by platforms that depend on asynchronous message exchange. Schultze considers absence to be a retreat into a private, internal and imagined world but in the context of social presence in close personal relationships, the idea of a private internal world takes on a new meaning; one that is internal to the relationship and is a joint private construction of both parties.

Not all close personal relationships can be assumed to benefit from the same technological facilitation: parental and marital relations normally imply deep personal commitment and strong emotional bonds but might furnish support and sharing in rather different ways. It could be that the type of the relationship makes a difference to the significance of being in touch through a particular technology: some may facilitate a presence that is welcome where others may serve to generate a consciousness of the other person that is difficult to manage. An improved understanding of how communication technologies support people in these circumstances could stimulate design innovation for core personal relationships. This paper reports a longitudinal study of communication technologies in personal relationships to better understand the relational phenomena which can help absent hearts grow fonder, rather than to go out of mind.

2 The absence, presence and emotional closeness of people who care

It may be possible to accomplish relationally meaningful acts through any communication medium. People maintain established relationships by recruiting familiar communication technologies, whether living in the same city or living at significant degrees of physical separation. It is important to leverage this familiarity when reflecting on the value that people find in technologies, to gain a better understanding of the properties of communication technologies that can be supportive. Building on prior methodological work in Social Presence (van Baren 2004) (Biocca and Harms 2003) (Gooch 2011), we consider how feelings of Social Presence in relationships are made manifest together with an explicitly relational concept, Closeness (Aron and Aron 1992) (Agnew et al 2004). We then consider how properties of the interactions through communications technologies contribute to relationship-relevant feelings.

2.1 Social Presence and personal relationships

Social Presence (SP), in Short, Williams and Christie's seminal work (Short and Williams 1976), has been a key concept in understanding the influence exerted by interactive communications media on the people who use them (Biocca and Harms 2003). By reaching into the world of human experience, it has promoted elements of the communication technology design problem beyond considerations of clarity and efficiency. Short, Williams and Christie considered SP to be "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship" (Short and Williams 1976, p. 65) and as a phenomenological construct owing to "whole constellations of cues" (Short and Williams 1976, p. 157). Thus we treat SP in technologically mediated personal relationships as something constructed in the mind of an individual out of the representations the other has crafted with the medium. That is, through their use of the medium and, critically, given each individual's understanding of the status of their ongoing relationship, the distant other performs actions that are intended to evoke a sense of themselves for the consumption of their loved-one. SP functions by highlighting the relationship with the other person in the mind of each interlocutor though the acts of communication they share. In the context of personal relationships, as distinct from professional or transactional relations, we argue that SP corresponds to the level of emotional connectedness to have been engendered in each act of communication.

In the context of personal relationships, a sense of presence is not guaranteed simply by the notional 'richness' of a medium, as was once thought (Daft 1985). For example, Connell et al. examined the social perception of personalities and intentions and projection of authority in the workplace. They found that the use of the telephone was associated with stronger feelings of SP than face-to-face communications, and Instant Messaging with weaker feelings of SP (Connell et al 2001). They argued that SP is generated during a conversation to an extent that is jointly permitted by the task (in this case centrally concerned with social relations) and the freedom of expression of the medium. It does not make sense to abstract prior knowledge and beliefs about other parties from a consideration of SP but to understand

how the status of relationships might interact with the properties of communication media.

2.2 Familiarity matters

The relational underpinning of the SP experience has not always been reflected in the way it has been investigated. Many laboratory studies have asked people who do not know one another to make SP judgements. Although valuable as models of first encounters, communication efficiency or simple transactional judgements, such studies tend to gloss over the relational element of the SP equation. In the 70's, 80's and early 90's, an ability to generate a sense of SP may also have been undermined by users' lack of familiarity with the technologies they were asked to use. The familiarity of users with CMC systems influences how they present themselves and how well they are able to 'see' one another. Bradner et al. found equivalent levels of SP for colleagues regardless of whether talking through a video link or application sharing (Bradner 2001). Shih and Swan, investigating asynchronous online discussion tools, note that the tone of communication affects feelings of SP, again indicating that it is not just a property of the communication medium but conditioned by how people interpret the tone of communicative acts within it (Shih 2005). A generalized view based on limited experiences with technologies leaves many questions unanswered, especially concerning relational communications phenomena (Walther ????).

Walther's investigation of mediated communication showed both the importance of extended time periods for appreciating relational exchanges and the power of reflection and revision in advance of message sending (Walther 1996). He found some couples, never having met for real prior to meeting online, had generated unparalleled idealizations of their relationship. He argued that this phenomenon, termed 'hyperpersonal communication', was the result of the extraordinary opportunities afforded by asychronous text for both people to meticulously and successively craft their self presentations which created a positive feedback loop of good feeling. The draft-revise-reflect interaction model embedded in the medium had fostered the production of a special distance identity, given sufficient opportunity for people to become familiar to the medium and to one another. At that time, text-based communication was the only major form of online interaction that had become an embedded component of the social world. The range of technical opportunities for people to establish and maintain personal relationships has since expanded considerably. The likes of SMS, email, IM, VOIP, online gaming, social network technologies, and increasingly broadband video have become routine components of many social interactions. Consequently they have become entwined with SP experiences in the moment of communication, extending a more enduring sense of the other person as a socially significant entity in ongoing relationships.

2.3 Social Presence, Closeness and physical separation

We argue that, when living apart, an individual's enduring feelings about their partner, sibling, friend, parent or child are cumulatively influenced by their experience of shared communication activities (Gooch 2011). The way people feel about one another on any given day sets the initial context for interpreting the relational meaning of a given communicative act. In the lull between communication acts, people consider the other person by remembering or being reminded of their most recent communications. Each communicative act, treated in our analysis as some episode such a phone call or receipt of an email, has an impact on a person's sense of their relationship with the other.

This dynamic can be studied by bringing together two established measures of interpersonal attitudes: SP semantic differentials (Short and Williams 1976) provide insight about per-communication experience of presence, and a well-established psychological instrument known as the 'Inclusion of Other in Self' (IOS) scale as an indicator of relational 'Closeness' (Aron and Aron 1992) (Agnew et al 2004). It is thus possible to infer an association between communication acts and long-term feelings of Closeness via self-report data on the degree to which each individual experiences the feeling that the other party is socially present to them (Gooch 2011). In this context, the factors governing how a communication medium contributes to the instantaneous experience of SP are inherently relational: sustaining a relationship whilst physically separated. From a design perspective, our goal is to better understand how constraints, such as pace of exchange, might contribute to the construction of new communications arenas for positive relational experiences.

Physical separation can mean a number of things. Separation is clearly a salient barrier for those in distance relationships. However, it may also be problematic from time to time for people in close relationships, even if they are cohabiting and thus seeing one another in the flesh outside of working hours. Absence can be critical even if separation is temporary. Whether for urgent matters, social coordination or mundane domestic reasons, such people may wish to seek reassurance or to share successes with one another during the day. Such experiences could result in different sorts of value being associated with different communication media. In each case, they must be considered against the backdrop of periodic physical encounters. It is rare that there are absolutely no opportunities for loved-ones to get together face-to-face: these encounters have to be considered alongside technologically mediated conversations.

In this paper, we present a joint analysis of Closeness and SP ratings and written reflections on the role media play

in relationships. Our data were provided by people in established relationships over an extended period, and for whom separation figured in their lives. Our analysis considers whether the way different communication media contribute to feelings of SP and relational Closeness depend on relationship type and separation distance and, if so, what might be inferred about the characteristics of these media that help to frame the relational design problem. We use our quantitative data to contrast the self-reported experiences of people in different types of personal relationship (partner, friend, sibling or parent-child). Our analysis differentiates among the range of familiar communication media our participants reported to have used with their separated loved one at some point during the study period (from SMS to Skype), and by whether or not our participants described themselves as in a distance relationship.

We find degrees of SP and Closeness to depend jointly upon relationship type and on communication media. We also find Distance relationships are associated with generally heightened sense of the other person compared to Same-City relationships, but that differentiation among the significance of media follows a very similar pattern.

3 Method

Experimental studies have few obvious strengths when it comes to providing answers to questions about the value of communication media for long-term distance relationships. The period of likely effect and the familiarity which underpins successful integration to domestic routine argue for longitudinal, field-based investigations. The relational sphere of human activity is, furthermore, largely about subjective meanings, attitudes and feelings rather than transparent communication activity. We chose to construct a longitudinal study (21 day recording period) around self-report activity from people who we asked to reflect on their communications with 'a person you feel close to'. The frame of relationship was thus as close and personal, and the bounding of their encounters as self-defined episodes of communication e.g. meeting face-to-face, a telephone call, an IM exchange or a sequence of SMS messages. Our participants committed to reporting on their feelings of Closeness towards the separated other, and on their SP experience of acts of communication. These ratings were combined as entries in a 'contact diary'. Participants were asked to complete them as soon after a communication event as was practicable. Additionally participants completed a 'daily diary' first thing in the morning, consisting or the closeness measure.

We focus mainly on people in distance relationships, whether the distance is of different continents, countries or cities. In our study, we treated distance relationships as a self-described matter, applying to people who are living at a degree of physical separation that face-to-face encounters are not an everyday matter. However, we also included smaller sample of people in Same-City relationships to better understand the contrast, if any, their experience of SP and Closeness in mediated encounters. In this way, we were able to additionally contextualize the relative experiential value of the communication media they recruit to support their relationships.

3.1 Social Presence - Semantic Differentials

In addition to ratings, the contact entries recorded basic information about the communication act. This included time of contact, length and method of communication and who initiated/ended the contact. Short, Williams and Christie's semantic differential scales were used to measure SP by contrasting diametrically opposed adjectives (including insensitive vs. sensitive, impersonal vs. personal, warm vs. cold, colourless vs. colourful) (Short and Williams 1976). Ratings are made by striking part-way through a horizontal line between each pair of differentials, representing the degree corresponding to their experience. The differentials are focused on the medium (e.g. 'Skype VOIP is impersonal vs. personal') and so are implicit in the way they evoke the sense of the other person (Biocca and Harms 2003). This is one of the motivations for also including a more explicit 'Closeness ' measure. We used nine pairs in total and so the burden of completing the SP ratings is small - an important element of a longitudinal study that seeks to record assessment close to the relevant event. Each individual score was computed as a sum of a participant's ratings of the nine semantic differential items (max score was thus 9 x 7 = 63).

3.2 Closeness - Inclusion of Other in Self

The measure of Closeness made use of the IOS scale (see (Aron and Aron 1992) and (Agnew et al 2004)). This operates in a manner akin to a graphical Likert scale, in that participants are asked to express their reaction to a question on a seven-point scale but each point on the scale is represented by an image rather than a number in a linear sequence. The question in IOS is 'Please circle the picture below which best describes your relationship with your [type] partner'. IOS represents points on this scale as seven pairs of circles, each labelled 'self' and 'other'. At one extreme - corresponding to 'not at all close' - shows self and other as two circles that abut to one another but do not intersect. The other extreme, the circles overlap almost completely, the non-intersecting portions thus representing only a small fraction of the individual selves preserved outside of the relationship. The five other points in between thus vary in the

degree to which respondents are able to express their relationship in terms of the proportion of themselves that is comprised of the other. Each score was thus between 1 (minimum Closeness) and 7 (maximum Closeness).

3.3 Participants

Participants were recruited through emails and posters on a British university campus. The range of relationships included lovers, friends, parents and siblings. 64 people took part in the study. Table 1 shows the breakdown of participants by distance and relationship type.

Relationship Type	Number of Participants	Number of Same-City Relationships	Number of Distant Relationships
Partner	16	6	10
Friend	16	7	9
Parent	20	2	18
Sibling	12	1	11

Table 1 Number of participants by separation and relationship

4 Results

Our 64 participants returned a total of 988 'contact reports' on relational communication episodes, each comprising a rating of Closeness, a rating of Social Presence and short description of who was involved, what it was for, who initiated and, if applicable, who ended the exchange. They additionally completed beginning-of-day ratings about the general sense of Closeness to the relevant other person. At the end of the 21 day study period, our participants wrote free-text responses to a set of open-ended questions about their relational experiences with each of the media they used (152 in total). This data is not presented here.

The mean number of contact reports returned by our 64 participants was 15.4, SD was 11.0, median was 14. The maximum for any individual was 58, the minimum was 0. Perhaps unsurprisingly, there was considerable variation between groups in the number of communication episodes our participants reported (e.g. distant vs. Same-City). The 'partner' relationship category accounted for the majority contact reports (N=421, mean=26.3, SD 12.1, median = 24), with submitting a similar overall number of reports regardless of separation (Distant = 228; Same-City = 193).

Our analysis resolves on ratings of episodes as the basic unit of observation, primarily to contrast SP and Closeness experiences with different communication media. The ratings data we gathered do not conform to the normal distribution (SP Shapiro-Wilk 0.978 (988 df); $p < .001$) (Closeness Shapiro-Wilk 0.923 (988 df); $p < .001$). The non-interval nature of ratings data are always problematic for parametric analyses. Given the inherently phenomenological nature of relational communication, any attempt to make sense of such data must treat the business of quantizing experience with care.

We sought a nonparametric statistical treatment that would in the first place permit us to consider what our data could express about relational experiences with communication media within relationship and distance groups. We adopted the Kruskal-Wallis mean ranks non-parametric one-way analysis of variance test to maintain a reasonable level of statistical conservatism whilst reflecting general characteristics of our full quantitative data set. We did not attempt to go further with our treatments to draw statistical inferences between groups; rather we go on to discuss how patterns of ratings between groups can be made sense of in relation to our qualitative data and in the wider context of relevant work.

4.1 Linking Social Presence and Closeness

The first thing we wanted to establish is what the connection between Social Presence and Closeness is. Our theory is that the short-term feeling of Social Presence impacts the longer-term feeling of Closeness. To test this we first looked at the contact rating of Social Presence against the absolute value of Closeness and the change in Closeness between days. The next test looks at the impact of no communication on Closeness ratings.

All daily diaries were completed at the beginning of the day. This allows us to investigate the impact of a day's communication, through it's social presence rating, against the absolute value of closeness on the following day and the /textitchange in closeness between the morning closeness rating and the following day's rating of closeness.

There were a total of 922 acts of communication which had social presence scores and a closeness rating for the following day.

The closeness data was grouped as being either low (rating of 1-2), medium (rating of 3-5) or high (rating of 6-7). We then associated each contact SP rating with the following day's closeness rating. A Kruskall Wallis test was then run against this data.

Table 2 shows the result of this test. The mean rank of SP rating differed significantly as a function of the absolute closeness rating ($H2) = 81.833$, $P < 0.001$). Contact SP scores are associated with low daily closeness ratings are lowest ranked, contact SP scores in the medium daily closeness group are higher and contact SP scores in the high daily closeness group are highest.

Spearmans rho shows a significant positive correlation between the SP scores and daily Closeness scores ($r = 0.301$,

n = 922, $p < 0.001$). Higher ratings of Closeness were correlated with higher ratings of SP.

This, along with the Kruskall-Wallis test, indicates that our model could be correct – communication acts with higher levels of social presence are associated with closeness ratings for the following day which are higher.

Starter Type	N	Mean Rank of Contact Social Presence Score
High	298	568.79
Medium	539	423.81
Low	85	324.38

Table 2 Mean rank of SP rating for each closeness value

When looking at the change in Closeness and SP, there was no significant difference. Our expectation was that high social presence ratings would be associated with increases in closeness, mid ratings of social presence would be associated with maintenance of social presence and low ratings of social presence with decreases in closeness.

What this expectation fails to capture is the fact that a change in closeness from 1 to 2 is grouped as 'Up' whereas maintaining a closeness rating of 6 is grouped as 'Maintenance'. A fine grain analysis of each possible change would have six factorial potential changes which is simply too many to make sense of. Instead, we have the analysis considering the absolute values.

Overall then, our data indicates that the short-term feeling of Social Presence has an impact on the longer-term feeling of Closeness.

4.1.1 What impact does lack of communication have on Closeness?

In addition to the positive aspects of communication on Closeness, we must also consider what happens when there is a lack of communication. Tables 3 and 4 combine our interest in change and absolute level of daily Closeness ratings to consider how frequency operates. Table 3 compares the number of days without communication and Table 4 contrasts the frequency of days when our participants got in touch with one another by some means.

The tables should be read as follows. Each cell represents the number of days with or without a communicative act which fall into a given daily closeness category. Columns organise the data by change, showing how frequency of presence or lack of communication relates to the decrease, maintenance or increase in closeness. Rows contrast the same data by absolute level – whether the daily closeness was rated at a low, medium or high level.

In total there were 596 days without communication and 676 days with communication. The significant features of the tables are as follows: firstly, looking at percentage values, the predominant absolute closeness value of non-communicative days were low to medium. Secondly the predominant absolute closeness value of days with communication was medium to high.

This fits well with the proposed model. There are more contactless days with low/medium levels of Closeness compared to days with communication. It could be that the absence of communication will mean that the lack of SP figures in our participants' understanding of their relationship, and may be equivalent to a low ranked score. The lower number of contactless days that were rated with high levels of Closeness, compared to high-rated days with communication, is consistent with this idea. The model thus fits with regards to the benefits of high SP and the negatives of an absence of SP. Looking at the distribution of communicative acts, as well as the level of SP ratings, leading up to each daily Closeness rating, it may be that frequency as well as level work together. The manner in which they are combined is probably not simply additive (one can have too much of a good thing) but this is a matter that requires further research.

	Down	**Same**	**Up**	***Total***	***Percent***
Low	40	91	8	139	23
Mid	67	222	71	360	61
High	4	61	32	97	16
Total	111	374	111		
Percent	18.5	62.5	18.5		

Table 3 Distribution of communication-free days by level of daily Closeness rating

	Down	**Same**	**Up**	***Total***	***Percent***
Low	34	27	7	68	10
Mid	120	179	84	383	57
High	18	125	82	225	33
Total	172	331	173		
Percent	25	49	26		

Table 4 Distribution of days with communicative acts by level of daily Closeness rating

4.2 Factors impacting Social Presence and Closeness

In addition to being interested in the relationship between SP and Closeness, we also wanted to look at what factors could impact on these feelings. As we previously discussed, Social Presence has generally been treated as a property of the communication technology. In addition to looking at the link between Closeness and SP, using the contact diaries, we

are looking for other factors relating to each communication act which impact upon feelings of Social Presence.

4.2.1 Does medium impact on experiences of SP and Closeness?

Many prior investigators have contrasted communications media through SP ratings in laboratory experiments. Our first questions was thus: would our longitudinal study of familiar media in relational communication show up similar rankings? We take the position that medium has an impact on SP but we argue that the medium is only a contributing factor.

Table 5 shows the mean ranks of contact SP against medium. As expected from prior work (Biocca and Harms 2003) (Short and Williams 1976), different media are associated with different ratings of SP. The mean rank of SP rating differed significantly as a function of the medium type ($H(10) = 175.37$, $p < 0.001$), with ratings of SP for Skype and face-to-face being very high, followed by a single rating of communication by greetings card, then Skype with video and telephone, and then progressively lower ranked media in the form of letters, IM, email, SMS, FB wall posts and of picture messaging.

Communication Medium	N	Mean Rank of SP Scores **(Rank order)** *[Mean rating]*
Skype	79	635.77 **(1)** *[52.20]*
Face to Face	246	634.80 **(2)** *[52.33]*
Card	1	613.50 **(3)** *[51.00]*
Skype with Video	19	544.47 **(4)** *[49.37]*
Telephone	208	530.13 **(5)** *[48.96]*
Letter	3	506.83 **(6)** *[48.33]*
IM	65	440.93 **(7)** *[46.02]*
Email	98	380.04 **(8)** *[44.14]*
SMS	258	353.28 **(9)** *[43.59]*
Facebook Wall Posts	9	247.06 **(10)** *[41.00]*
Picture Message	2	79.25 **(11)** *[33.00]*

Table 5 Mean rank of SP rating for each medium type *[mean rating]*

Rankings of Closeness ratings also contrasted communications media ($H(10) = 102.87$, $p < 0.001$), but there is no prior work against which to compare this finding. The mean ranks of contact Closeness ratings were all very high for communication by letter, card and Skype with Video, followed by face-to-face and regular Skype, then progressively lower-ranked levels of Closeness for telephone, SMS, email, IM, picture messaging and FB wall posts respectively. Our data are unsuitable for post-hoc statistical analysis due to the large differences in numbers of cases by medium: four categories of medium (FB wall posts, card, letter and picture messaging) were rated fewer than ten times across all participants. Other statistical analyses reported in this paper shall exclude these communication media.

Communication Medium	N	Mean Rank of Closeness **(Rank)** *[Mean Rating]*
Skype with Video	19	687.11 **(1)** *[6.05]*
Card	1	685.50 **(2)** *[6.00]*
Letter	3	675.83 **(3)** *[6.00]*
Face to Face	246	595.22 **(4)** *[5.54]*
Skype	79	579.71 **(5)** *[5.54]*
Telephone	208	503.69 **(6)** *[5.17]*
SMS	258	434.41 **(7)** *[4.84]*
Email	98	398.22 **(8)** *[4.64]*
IM	65	336.78 **(9)** *[4.34]*
Picture Message	2	267.25 **(10)** *[4.00]*
Facebook Wall Posts	9	253.11 **(11)** *[4.00]*

Table 6 Mean rank of Closeness ratings for each medium *[mean rating]*

It is striking that the Closeness ranking of Skype-with-Video is ahead of both face-to-face communication and Skype VOIP, whereas the reverse pattern seems to apply to our participants' ratings of SP. Similarly, the SP rank order places IM higher than SMS, whereas the reverse is true for Closeness. More generally, our ratings data for Closeness and SP support the idea that experiences with media in close personal relationships are differentiated, such that a particular medium may be stronger in one aspect of relationship support than in another.

4.2.2 Do SP and Closeness differ by relationship type?

The second factor we wished to look at was how different relationship types impact upon SP. Table 7 shows the mean rank of contact SP for the various relationship types within the study. The mean rank of SP rating differed significantly as a function of relationship type ($H(3) = 43.369$, $p < 0.001$). Different relationships have different values of SP. Likewise, the mean rank of Closeness rating differed significantly as a function of relationship type ($H(3) = 51.326$, $p < 0.001$). Different relationships have different values of Closeness.

Relationship	N	SP Mean Rank *[Rating]*	Closeness Mean Rank *[Rating]*
Partner	421	549.55 *[49.52]*	555.20 *[5.41]*
Friend	73	495.97 *[43.27]*	388.31 *[4.56]*
Parent	256	440.20 *[47.98]*	415.49 *[4.68]*
Sibling	238	348.90 *[46.32]*	504.68 *[5.19]*

Table 7 Mean ranks of SP and Closeness ratings by type of relationship

4.2.3 Do SP and Closeness differ by type of separation?

The final factor to look at is the impact of distance on SP. There were 48 relationships which were distant, 16 which

Separation Distance	N	SP Mean Rank *[Rating]*	Closeness Mean Rank *[Rating]*
Distant	627	520.60 *[48.74]*	508.60 *[5.19*]
Same-City	361	449.16 *[46.41]*	470.01 *[4.96]*

Table 8 Mean ranks of SP and Closeness by separation

were Same-City. 627 communication acts were from distant participants, 361 from Same-City participants

The mean rank of SP differed significantly as a function of relationship separation (H(1) = 14.385, $p < 0.001$). Distant relationships had higher SP scores than Same-City relationships. Likewise, the mean rank of Closeness differed significantly as a function of relationship separation (H(1) = 4.380, $p < 0.036$). Distant relationships had higher Closeness scores than Same-City relationships.

4.2.4 Orthogonality of Medium, Relationship Type and Separation

In order to check that the three factors discussed here are independently contributing to SP ratings, we ran a multiple linear regression analysis. We are reporting only the significance and values of the final model as all of the models show that the factors independently impact upon feelings of SP (Mean Square = 1543.404, F = 19.534, $p < 0.001$).

Factor	B	Std. Error	Beta	t	Sig.
Medium	-.701	.177	-.133	-3.972	.000
Relationship Type	-1.375	.288	-.149	-4.773	.000
Distance	-3.507	.633	-.185	-5.537	.000

Table 9 Regression testing SP

Having established the basic characteristics of our data set, we now consider how patterns of ratings for each medium differ by Separation and by relationship type. To do this, we include only media with more than 10 individual ratings (eliminating 15 reports from our quantitative data set). We decided to retain Skype+video, although the low proportion of reports (19 out of 973 retained) permit limited statistical inference, because it includes a live image of the absent other; an important quality for our analysis. The mean rank score is presented to help characterize the response profile for both SP and Closeness ratings. The mean ratings *(in italics)* are also presented to help express the sense of the ratings provided by our participants, not for the purpose of statistical comparison. Overall, these mean ratings suggest that communications through all forms of media were associated with positive Social Presence and Closeness experiences because all lie above the scale midpoints (range 1-7, midpoint 4 for Closeness; range 9-63, midpoint 27 for SP).

4.3 Contrasting SP and Closeness rating of Medium by Separation Distance and Relationship Type

We next consider how combinations of relationship, medium and separation might work together in terms of SP and Closeness ratings. Although this is essentially a factorial matter, our data do not support a straight-forward non-parametric multivariate analysis. Our analysis will be to formally contrast rank orderings within groups and informally consider differences in rank ordering between groups. Each group is either a relationship type (romantic partner, parental, close friend, or sibling relationship) or a distance type (Same-City or distant relationship), whereas medium is a within-group factor. We present both Kruskal Wallace rank order data and, to help interpret them, mean rating scores.

4.3.1 SP and Closeness ratings by medium within relationship

Table 10 shows the the absolute rank (in bold) and mean rank rating for each type of relationship against each type of medium for communication media. In this way, it is possible to see the rank order in which each medium was able to promote a sense of SP and Closeness among our participants.

Medium	SP within Relationship *(Mean Rating)*			
	Romantic partner	Parental	Close Friend	Sibling
Face to Face	278.95 *(55.16)* **1**	138.49 *(49.65)* **3**	57.00 *(51.25)* **2**	132.61 *(48.13)* **2**
Skype	250.07 *(53.09)* **2**	192.90 *(55.65)* **1**	27.12 *(40.67)* **6**	121.50 *(46.92)* **5**
Telephone	220.00 *(50.10)* **3**	150.46 *(51.08)* **2**	43.32 *(46.79)* **3**	128.79 *(47.35)* **3**
Skype+video	161.50 *(46.00)* **4**	131.50 *(49.33)* **4**	67.00 *(58.00)* **1**	144.36 *(49.00)* **1**
SMS	140.87 *(44.00)* **5**	89.36 *(44.41)* **7**	23.37 *(38.90)* **7**	89.32 *(43.44)* **7**
IM	111.15 *(40.20)* **6**	126.77 *(48.40)* **5**	29.78 *(41.56)* **4**	104.67 *(44.67)* **6**
Email	89.89 *(38.39)* **7**	97.20 *(45.44)* **6**	27.55 *(40.70)* **5**	122.19 *(46.49)* **4**

Table 10 Mean rank SP for each Medium by Relationship *(Mean rating)*

All four relationship types differed with regard to SP experiences across communication media (see Table 10). Specifically, the mean rank of SP ratings differed significantly as a function of the medium for partners (H(6) = 107.53, p <

Medium	Closeness within Rel'ship *(Mean Rating)*			
	Romantic partner	Parental	Close Friend	Sibling
Face to Face	274.83 *(6.09)* **1**	139.35 *(4.86)* **3**	44.19 *(5.25)* **2**	116.31 *(5.13)* **4**
Skype+Video	252.00 *(6.00)* **2**	111.17 *(4.67)* **5**	65.50 *(7.00)* **1**	175.89 *(6.29)* **1**
Skype	226.09 *(5.63)* **3**	147.70 *(5.20)* **1**	41.33 *(5.00)* **4**	161.54 *(5.92)* **2**
Telephone	188.79 *(5.15)* **4**	142.12 *(5.08)* **2**	42.47 *(5.16)* **3**	121.48 *(5.22)* **3**
SMS	174.38 *(5.04)* **5**	112.75 *(4.50)* **4**	31.11 *(4.26)* **5**	107.30 *(5.00)* **5**
IM	144.15 *(4.70)* **6**	107.13 *(4.47)* **7**	18.39 *(3.34)* **7**	75.17 *(4.34)* **7**
Email	129.42 *(4.39)* **7**	110.94 *(4.56)* **6**	30.85 *(4.20)* **6**	100.68 *(4.89)* **6**

Table 11 Mean rank Closeness for each Medium by Relationship

Medium	SP rank by Separation		Closeness rank by Separation	
	Same City	Distant	Same City	Distant
Face to Face	218.52 *(49.67)* **1**	470.03 *(57.21)* **1**	200.30 *(5.14)* **2**	440.04 *(6.25)* **1**
Skype	na *(na)* **na**	374.22 *(52.20)* **2**	na *(na)* **na**	346.88 *(5.54)* **3**
Skype +video	215.00 *(49.00)* **2**	315.44 *(49.41)* **3**	218.25 *(5.50)* **1**	421.65 *(6.12)* **2**
Telephone	201.83 *(48.22)* **3**	314.17 *(49.20)* **4**	194.90 *(5.20)* **3**	301.64 *(5.16)* **4**
IM	165.58 *(44.72)* **4**	263.45 *(46.83)* **5**	155.70 *(4.68)* **5**	175.14 *(4.13)* **7**
Email	106.22 *(39.35)* **6**	235.17 *(45.37)* **6**	160.32 *(4.60)* **4**	235.04 *(4.65)* **6**
SMS	130.85 *(42.27)* **5**	217.88 *(44.49)* **7**	154.01 *(4.68)* **6**	272.91 *(4.94)* **5**

Table 12 Mean rank ratings of SP (left columns) and Closeness (right columns) - Medium by Separation

0.001), for parents (H(6) = 42.00, $p < 0.001$), for friends (H(6) = 24.33, $p < 0.001$) and for siblings (H(6) = 16.47, $p = 0.011$).

Ratings of Closeness suggest that something different is going on (see Table 11). Closeness ratings for parents did not differ significantly by medium but the experience of Closeness does differentiate media when with partners (H(6) = 63.78, $p < 0.001$), with friends (H(6) = 14.76, $p = 0.022$) and also with siblings (H(6) = 22.43, $p = 0.001$).

4.3.2 SP and Closeness ratings by distance within relationship

In principle, people may have different experiences of communication through media if it is hard for them to meet face-to-face. Here, we present data to contrast not the absolute but the relative sense of SP and Closeness rated by our participants with different media according to the distance of the relationship in which they were involved. Table 12 shows the absolute rank (in bold), mean rating (*in italics*) and mean rank rating for each type of relationship against each type of medium for communication media that had, overall, received more than 10 individual ratings. The mean rank score is presented to help characterize the response profile for each category of rating. Again, the mean ratings are presented to help interpret the ranking of media, not for statistical comparison.

Table 12 presents the mean-rank scores *(and mean ratings)*for SP and Closeness ratings for each of our categories of relationship separation. Again, we are only reporting data for those media with more than 10 individual ratings over all. In this way, it is possible to see the strength with which each medium was associated with a sense of SP and Closeness within each relationship distance group. We find significant rank order differences across media in all cases. The mean rank of the SP rating differed significantly as a function of the medium for Same-City relationships (H(5) = 57.72, $p < 0.001$) and for distant relationships (H(6) = 140.43, $p < 0.001$). Closeness ratings contrast communications media both for those in Same-City relationships (H(5) = 16.60, $p < 0.005$) and for those in distance relationships (H(6) = 106.22, $p < 0.001$). Informally considering the pattern of rankings, our data suggest that IM and SMS may be interpreted differently according to separation. IM and SMS seem to be rated for Closeness in a very similar way feelings for Same-City folks, whereas for those in distance relationships feelings of Closeness as higher for SMS communications than for IM.

4.3.3 Summary of Closeness and SP ratings data

From the quantitative data then, we are in a position to argue three things. Firstly that the communication media used does have an impact on feelings of Social Presence and Closeness. Secondly, the relationship of the participants involved in the communication act ranks communication media in different order by intensity. Finally our data shows that the distance of the relationship also matters: Distant relation-

ships are associated with higher ratings of SP and Closeness than Same-City relationships.

5 Discussion

The most notable finding from our data is the relationship between Social Presence and Closeness. This is important as it broadens our understanding of Social Presence; the instantaneous impact of Social Presence during a communication act impacts upon the longer-term feeling of Closeness between the people in the relationship. It could be argued that this increases the significance of Social Presence as it has an impact beyond the communication act it is associated with.

The second important findings are that the one-way effects (medium, relationship type and separation distance) are all significantly implicated in the two types of feeling we examined (SP and Closeness). In terms of media effects, though the SP result is unsurprising, the longitudinal real-world event-sampling data collection lends it special value in the context of prior research on SP. Separation seems to generate different emphases on the importance of specific communication media. Distance relationships seem to intensify the sense of the other person compared to Same-City relationships across all communication media. More importantly, ratings of both SP and Closeness clearly depend on the type of the relationship. This allows us to consider SP findings with regards to the context they are gathered within.

The IoS Closeness results are entirely novel in respect of our analysis of separation in close personal relationships. Significant differences in rank orders of medium were found across all media within all relationship categories except for the very stable 'parental' Closeness ratings. From these findings, we infer that degrees of both SP and Closeness depend jointly upon relationship type and on communication media, and media contribute to these different experiences in different ways. Looking beyond these one-way statistical effects statements, we wish to consider how ideas might be drawn from our data towards the design side of technologies for relational communication. There is no sense in which the following considerations should read as empirical conclusions: we set out to study relational communication with a variety of media in search of new understanding of the theoretical concepts.

Within the set of media in our study, Closeness and SP ratings set sychronous voice and visual encounters above all text media. A consideration of text media shows that Closeness ratings may be stronger for SMS than IM, and SP ratings higher for IM than SMS respectively. Taken together, our quantitative and qualitative data suggest differences that favour IM for higher levels of SP, and SMS for higher levels of Closeness. An explanation appears to be straightforward for 'synchronous' IM: cotemporality (Clark 1996) may be a key property of a medium for generating a sense of SP. However, considering a tentative link between SMS and Closeness is more intriguing. Our qualitative data help to make sense of this with reference to the revisitation or 're-experiencing' of possibly cherished communications.

It is important to consider possible artefacts in our analysis. Data collected with longitudinal self-report studies represent a particular perspective on every-day phenomena. People may self censor, confabulate and forget to report or miss relevant episodes. The risk of these was minimised by making the diary entries as short as possible such that the effort required to fill them in was minimised. That Distant relationships were found to be have higher SP scores than Same-City ones could be explained by having relatively incomplete data on Same-City communications. However, this difference is in accordance with our point of departure: for distance relationships, communication media are vital for sustaining the relationship.

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